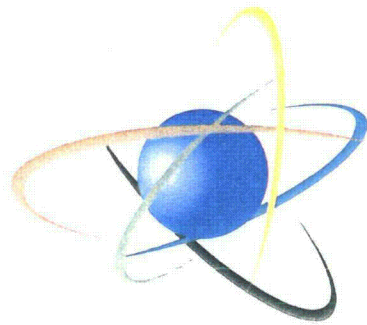


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**U.S.NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

# State-of-the-Art Reactor Consequence Analyses (SOARCA)

Semi-Annual Briefing for  
Commission TAs  
August 13, 2009

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4/9

## **Presentation Outline**

- Status of Project
- Peer Review
- Upcoming Dates
- Communications Activities
- Seismic (EP) Study

## Status of Project

- Accomplishments since last TA briefing (4/17/2009)
  - Seismic (EP) study for Peach Bottom and Surry
  - Draft NUREG
  - SRA Webinar Held 7/20/2009
  - First Peer Review Committee Meeting
- Challenges
  - Aggressive schedule to meet WITS Due Dates
  - Staff continuity and available expertise
    - Sequoyah analysis is on hold
  - Differing technical views remain

## **Review of Draft Executive Summary**

- Differing technical views were not considered in the Executive Summary included with SECY-09-0045
  - Met with staff to review comments
  - Revised Executive Summary provided to Peer Review Committee July 2<sup>nd</sup>
  - Draft provided to DEDMRT and management steering committee
- Work continues on revisions
- Engaging Peer Review Committee with subset of issues

# Management Steering Committee

- Met with steering committee July 22<sup>nd</sup>
  - Provided revised draft Executive Summary
  - Summarized and discussed comments
- Steering committee suggested engaging the Peer Review committee
  - Members to provide suggestions on which issues to provide for Peer Review
- May add Regional Representation

# Peer Review

- Chair
  - Karen Vierow (Associate Professor, Nuclear Engineering, Texas A&M)
- PRA Sequence Selection & Mitigative Measures
  - Bruce Mrowca (ISL)
  - Ken Canavan (EPRI)
- Accident Progression and Radiological Release
  - Bernard Clement (IRSN)
  - Robert Henry (Fauske and Associates)
  - Jeff Gabor (ERIN Engineering)
- Offsite Radiological Consequences
  - Kevin O’Kula (Washington Safety Management Solutions LLC URS Corporation - Washington Division)
  - Dave Leaver (WorleyParsons Polestar)
- Emergency Preparedness
  - Roger Kowieski (Natural and Technological Hazards Management Consulting, Inc. )
- Structural Failure (Seismic) Expert
  - John Stevenson (JD Stevenson Consulting Engineer)
- Health Effects
  - Jacquelyn Yanch (Professor, Nuclear Engineering, MIT)

## Peer Review Charter

- Requesting individual input
  - Non-FACA committee – no consensus sought
- Seeking review to “...insure that the study is best estimate and technically sound.”
- Specifically requesting review of the robustness of conclusions and Executive Summary

## **Preliminary Summary of Peer Review Comments**

- 72 comments received August 7<sup>th</sup>
  - Currently reviewing and prioritizing
- Summary of Comments
  - Plans for uncertainty study
    - not all members commented on the issue
    - Committee “seemed” OK publishing without the uncertainty study
    - interested in our parameters and their ranges
  - Committee discussed the robustness of the MELCOR calculations
    - focused on equipment performance and structural failure modeling
    - requested sensitivity studies
  - The probability of the success of mitigation
    - can operators perform the functions?
    - are mitigative measures included in current plant procedures?
    - justification for our assumptions
    - how to discuss the mitigated vs. unmitigated results in the Executive study.

## Upcoming Dates

- Peer Review Meetings
  - 09/15-16/09 (scheduled)
  - 11/10-11/09 (tentative)
- Uncertainty analysis
  - estimated completion date April 2010
  - planning to request peer review input and feedback
- OECD/NEA workshop on Implementation of Severe Accident Management Measures, October 2009
- ACRS
  - Subcommittee Meeting 11/4/09
  - Full Committee Meeting 11/5/09
- Final NUREG Including Peer Review and Recommendation Regarding Future Work
  - to SECY 1/29/10

## Communications Accomplishments

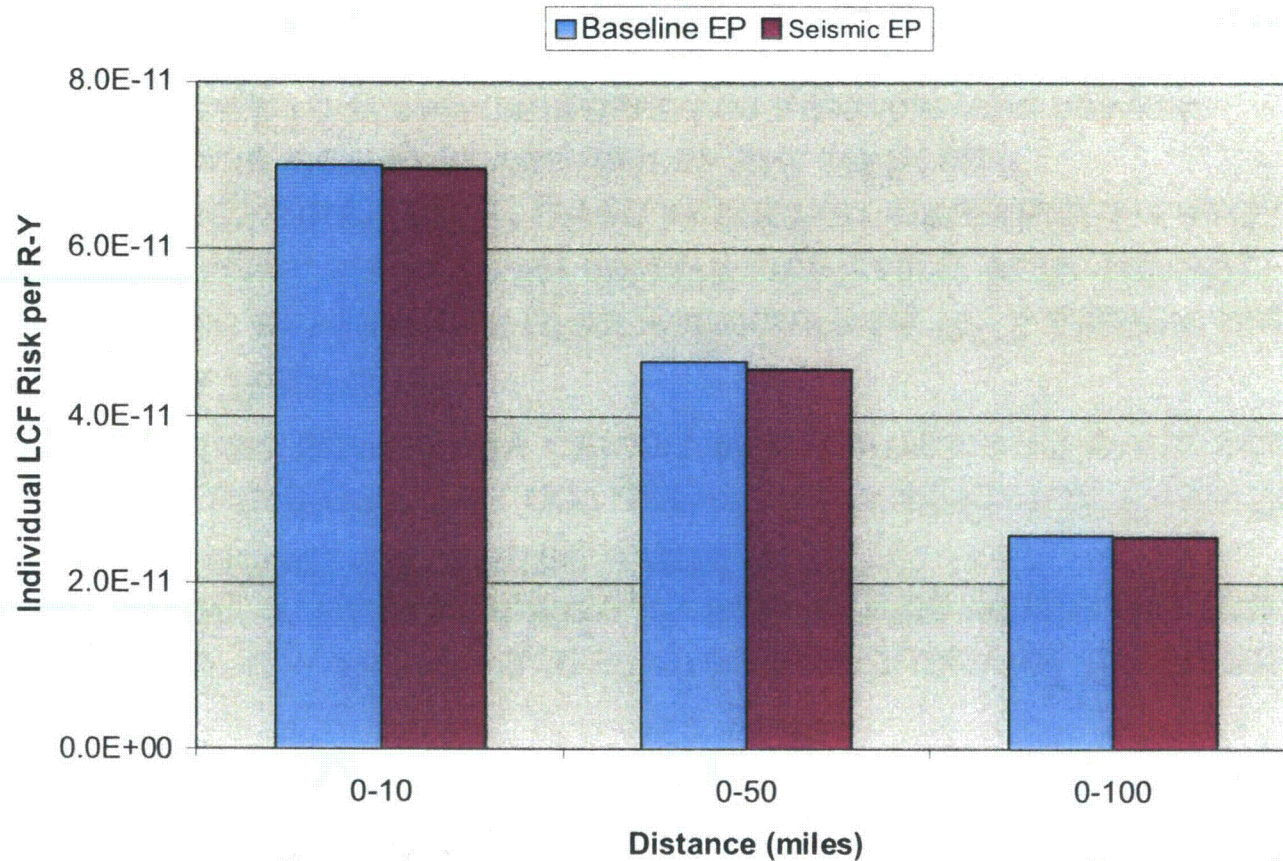
- SOARCA public website updated to reflect Communication Plan provided to Commission in SECY-09-0045.
- *NRC Reporter* and *The Researcher* articles published for staff communication
- OPA Briefed NEI Communications Staff on SOARCA
- Revised Communications Plan to Recognize the Need to Brief our Federal Partners such as FEMA, EPA, etc.

## Seismic (EP) Study

- Background – ACRS questioned adequacy of EP modeling (for seismically initiated SOARCA scenarios) which did not explicitly consider effect of seismic event on EP
- Past risk studies have not generally considered this effect except as simplified sensitivity calcs (delay times and evac speed)
- SOARCA Approach
  - Seismic assessment of infrastructure by RES seismic experts
    - Bridges, roads, power network (notification, traffic signals)
  - Reassessment of EP given impact on infrastructure and ORO's
    - Route alerting assessment by SNL/NSIR staff
    - New ETE assessment based on available road network
    - New EP model developed for MACCS2
  - Recalculation of offsite consequences
- Conclusion – No substantial effect on offsite health consequences

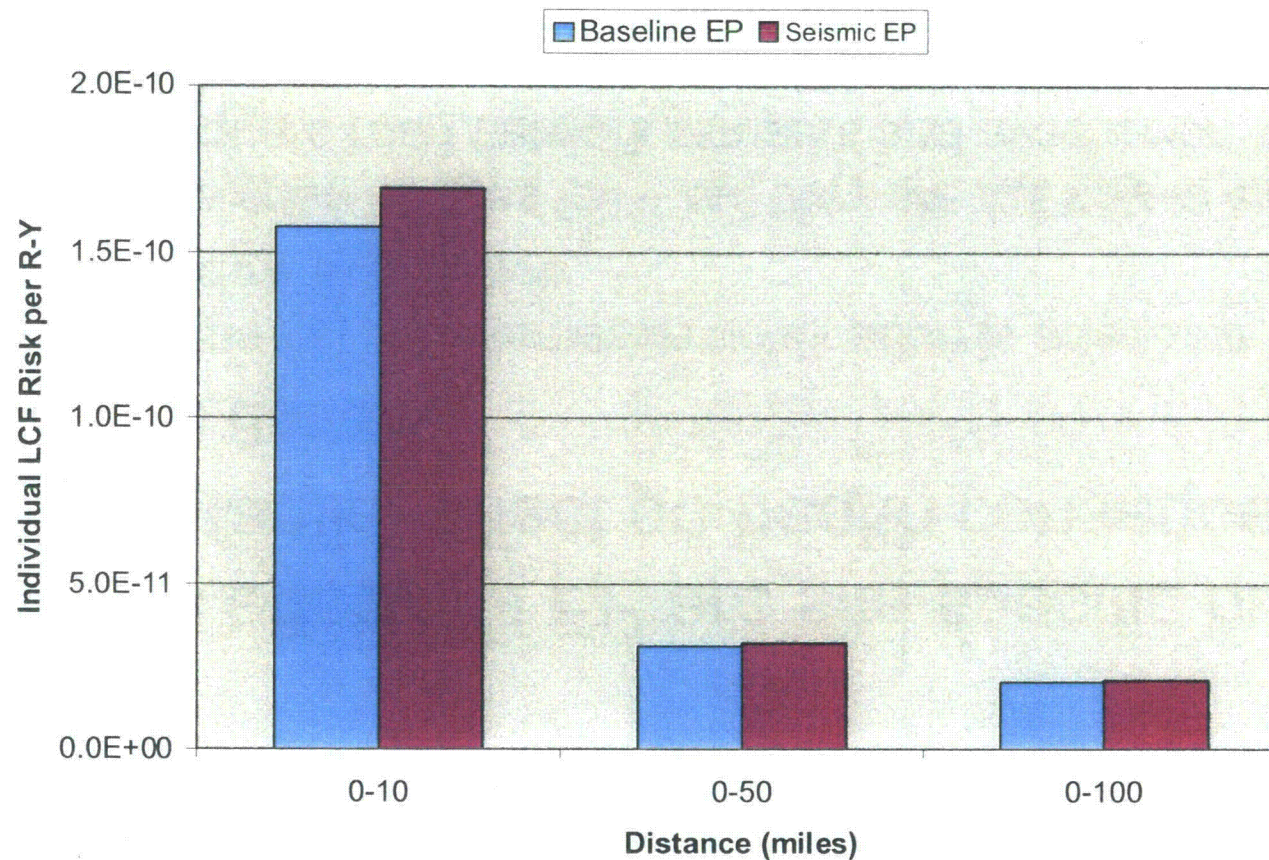
# Seismic (EP) Study

Peach Bottom - Unmitigated Short-Term SBO  
Assuming LNT



# Seismic (EP) Study

Surry - Unmitigated Thermally Induced Steam Generator Tube Rupture  
Assuming LNT



## Seismic (EP) Study

- Seismic effects of EP are site specific but with no substantial effect on health consequences
  - Peach Bottom
    - Sirens fail but alternative notification is adequate, larger shadow evacuation
    - Free span bridges fail – but they are not key to evacuation, adequate road network remains and evacuation speeds are unchanged
    - In addition, sequence timing predicted by realistic analysis is delayed so that there is some “margin” for EP activation and execution



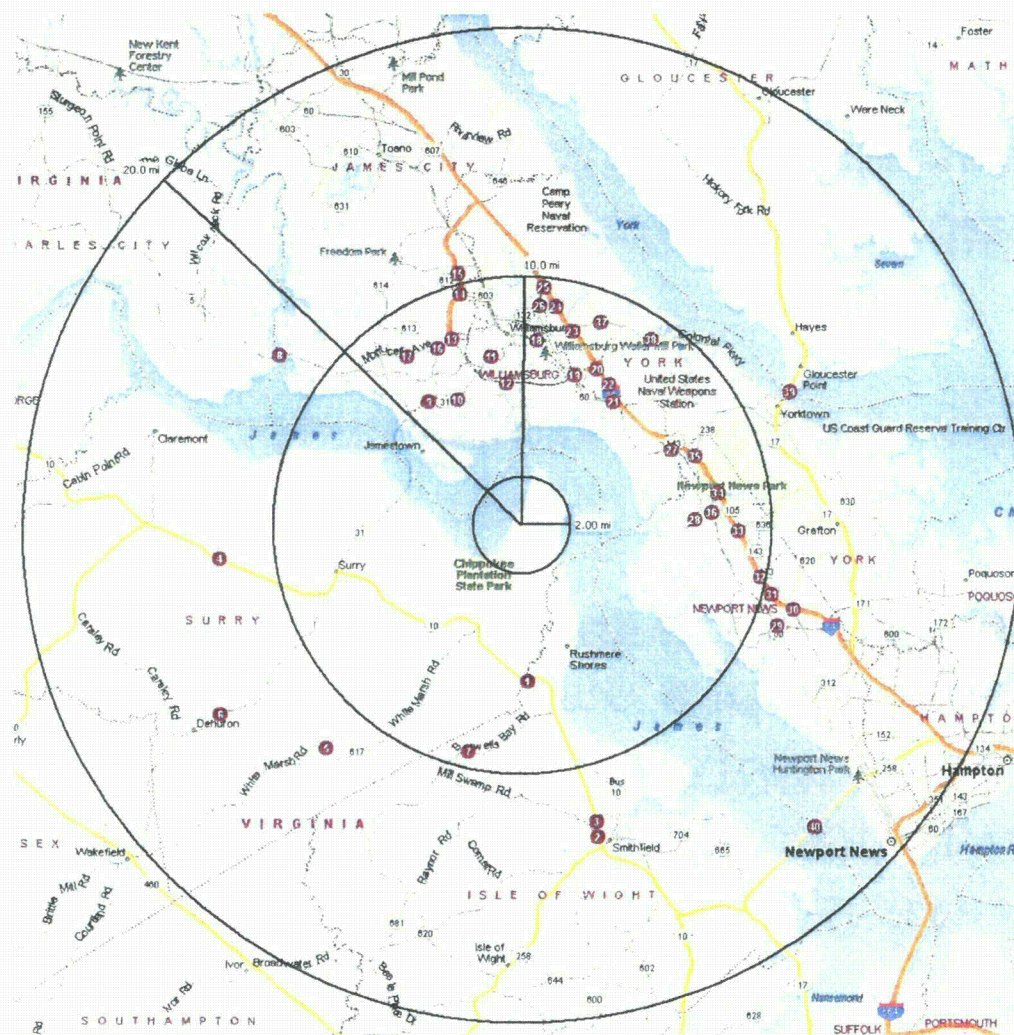
# Seismic (EP) Study

## – Surry

- Sirens function, public evacuation starts earlier, shadow evac occurs, schools delayed
- Bridge failures significantly retard evacuation – major effect on evacuation speed
- Smaller radiological release, LCF dominated by long term

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# Seismic (EP) Study



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## Conclusions

- SOARCA represents major change from the way people perceive severe reactor accidents and their likelihood and consequences
  - Mitigation is likely (due to time and redundancy) and, when it is implemented, effective in preventing core damage
    - Impact on existing level 1 PRA
  - Unmitigated accidents progress more slowly with smaller releases, no LERF
    - Impact on existing level 2 PRA
  - Early fatality risk lower than previous studies
  - Dominance of external events suggests need for corresponding PRA focus
    - Seismic research needed